

THE AIR DEFENCE OF THE BRISTOL AREA 1937-44



JOHN PENNY

THE BRISTOL BRANCH OF THE HISTORICAL ASSOCIATION LOCAL HISTORY PAMPHLETS

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The Air Defence of the Bristol Area 1937-44 is the ninetieth pamphlet in the Local History series published by the Bristol Branch of the Historical Association.

This is the second pamphlet to be drawn from the wartime archive assembled by the author. It shows the complex organisation which lay behind the guns and searchlights which most citizens regarded as the main defences of the city and one which was not appreciated at the time. It is intended to complement the earlier pamphlet (No. 85) on the Luftwaffe Operations over Bristol.

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Cover Illustration: Badges worn by Anti-Aircraft personnel defending Bristol. Top left: 5th A.A. Division, 1939-40. (Colours: falling aircraft in black, five red flames rising upwards from the wings and fuselage, the whole on a khaki square background). Top right: 8th A.A. Division, 1941-42. (Colours: falling aircraft in black, a red eight-pointed star superimposed on the fuselage, the whole on a sky blue square background). Bottom centre: A.A. Command, including all formations and units of the Air Defence of Great Britain, 1943-44. (Colours: a black bow and arrow aimed upwards, set on a scarlet square).



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THE AIR DEFENCE OF THE BRISTOL AREA 1937-44

During the Second World War Bristol was attacked by German aircraft flying from airfields in Northern France and the Low Countries, the onslaught lasting from the night of June 18th 1940 until the early hours of May 15th 1944. To counter these raiders a complex air defence system was established containing a number of diverse but integrated elements. Although an attack on the city could involve defensive operations taking place within an area extending from the Continent to South Wales, this account confines itself mainly to the provisions made in and around the Bristol Gun Defended Area, which steadily increased in size until it stretched from Weston-super-Mare to Bath. During a conflict in which the local heavy anti-aircraft guns fired around 59,000 rounds at enemy aircraft, some two searchlight operators, three fighter pilots, three men engaged in bomb disposal, five anti-aircraft gunners and six balloon operators lost their lives, while the courage of the defenders resulted in the award of a George Cross, a George Medal and a Military Medal. However, in the understandable atmosphere of wartime secrecy and censorship there was a proliferation of myths such as the existence locally of a single monster anti-aircraft gun called 'Purdawn Percy' so in order to dispel these, wherever possible, use has been made of surviving military records.

Throughout the war the formation with the overall responsibility for the air defence of the United Kingdom was the Royal Air Force's Fighter Command which operated the fighter aircraft and coastal radar stations. Also under their operational control were the Observer Corps, RAF Balloon Command, and the Army's Anti-Aircraft Command. In addition decoy sites and a radio countermeasures organisation were provided under the auspices of the Air Ministry, the Ministry of Home Security was responsible for the static smoke screens operated by the Army, while the Army and Royal Navy had specialist units available for dealing with unexploded bombs and aerial mines. The first step towards providing an

air defence system for the Bristol area was taken in 1937 when No. 23 Observer Corps Group was established at Bristol. By June 1938 this formation, the principal task of which was the plotting and identification of enemy aircraft over land, had set up some 33 Observer Posts covering Bristol, North Somerset, South Gloucestershire and Wiltshire, the most local being at West Harptree, Weston-super-Mare, Winscombe, Clevedon, Keynsham, Long Ashton, Avonmouth and Almondsbury. The Corps also provided information from which Fighter Command initiated the Air Raid Warnings throughout the country, and in April 1941 received the title 'Royal' in recognition of the valuable work it was undertaking, often by men working in long hours in posts in exposed locations with little protection from the elements and with no opportunity to light a fire which would be seen from the air.

In September 1938 the government announced that balloon barrage protection was to be provided for a number of provincial towns and cities including Bristol, where it was decided that the presence of Filton aerodrome prevented the use of balloons to cover the whole area. Two small independent layouts were therefore proposed to protect the harbour installations at Avonmouth and the Bristol City Docks. The system involved raising a lethal cable barrage into the air around the potential target compelling an enemy bomber to fly above the balloons at heights at which other anti-aircraft weapons could be used against it more effectively, and from which it would bomb less accurately. The balloons employed were flown from a mobile winch and were designed to be deployed at a maximum altitude of 5000 feet. When the barrage area was not directly threatened the balloons were grounded or kept close hauled at 500 feet to provide as little potential danger as possible to 'friendly' aircraft. Provincial barrages were initially organised into Auxiliary Air Force Squadrons operating some 24 balloons each. In each locality depots, known as Balloon Centres, were formed to administer the balloon squadrons and to be responsible for the assembly and testing of balloons and the training of balloon crews in time of war. In the Bristol area February 1939 saw the start of recruiting for the three 'County of Gloucester' Squadrons, Nos. 927, 928 and 929, with these moving to Pucklechurch on August 9th when the new camp was taken over as the permanent home for the local No. 11 Balloon Centre. In order to supply sufficient hydrogen gas for the balloons in the western barrages Imperial Chemical Industries erected a new hydrogen plant at Weston-super-Mare Gas Works which by the end of 1939 was already producing 2,500,000 cubic feet of hydrogen a week.

By late 1938 it had become obvious to the War Office that recruiting for their new anti-aircraft and searchlight formations was not proceeding

fast enough to provide the necessary personnel and so they asked for existing Territorial Army units of other rôles and other arms to accept conversion to anti-aircraft duties. As a result in Bristol on at the beginning of November 1938 the 66th (South Midland) Field Brigade took over heavy anti-aircraft duties, becoming the 76th Heavy Anti-Aircraft Regiment, while the 4th (City of Bristol) Battalion, The Gloucestershire Regiment, was re-designated the 66th Searchlight Regiment. At the outbreak of war heavy anti-aircraft guns for the close defence of potential targets in Britain were in very short supply as the first production model of the new and improved Vickers 3.7" gun with an effective engagement ceiling of 25,000 feet had only appeared in early 1938. In addition some of the lower performance 3" 20 cwt. semi-mobile guns were available as a stop-gap measure, but these were essentially little more than a World War I weapon on a modified carriage, with an effective ceiling of only 14,000 feet. Initially four-gun positions were built, except at airfields where two guns were acceptable, and at this time before suitable gun-laying radar became available, action with any degree of accuracy was only possible against visible targets, otherwise only blind, geographical, barrages could be fired by the guns. To assist the guns and fighter aircraft an elaborate searchlight layout was prepared for Southern England, with each major Gun Defended Area, such as Bristol, being provided with a local system to provide illumination for night engagements. Here the searchlights were to be deployed in groups of 48 on a 3500 yard spacing, the 90cm carbon-arc projectors provided for this purpose being capable of producing some 210 million candle power. By late 1939 improved sound locators to operate with searchlights had also been introduced and apart from directing the searchlight beams, the new locators were also intended to assist in the plotting of night raids.

Light anti-aircraft guns were also provided to give protection from attacks carried out at altitudes of less than 3000 feet against certain important installations known as 'Vulnerable Points' and these included the Bristol Aeroplane Company's factory at Filton, Filton Aerodrome, the National Smelting plant at Avonmouth, the Electricity Power Station at Portishead and Parnall Aircraft at Yate. In December 1938 the 23rd Light Anti-Aircraft Regiment was formed at Bristol to which a number of Territorial Army Reserve personnel were recruited, resulting, at the outbreak of war, in the guns often being manned by shifts of workers on sites near their places of employment. However, due to a severe lack of personnel and equipment many of the sites allocated to the regiment were initially occupied by men from heavy, rocket and searchlight batteries, and it was to be May 1940 before the situation was anything like being resolved, although the provision of adequate weapons

remained a problem for several years. Originally it had been assumed that 0.303" Lewis guns would be adequate, but it was soon realised that a specialised weapon would be necessary. The mobile single barrel Swedish Bofors 40mm gun was selected as the ideal equipment, but due to manufacturing problems by late 1939 few had been issued, and not until 1942 did production overtake demand. In an attempt to rectify this situation during the first three years of war the shortfall was mainly made up by using Vickers Mark VIII naval two-pounders with specially designed land mountings, old World War One 3" heavy anti-aircraft guns fitted with deflection sights, and Hispano 20mm cannons, but all of these proved to be far from ideal.

At the beginning of December 1938 Bristol's own No. 501 (County of Gloucester) Squadron, Auxiliary Airforce, at that time flying bombers from Filton airfield was finally re-designated a fighter squadron with a complement of some 20 pilots and 16 aircraft, 12 of which were to be at operational readiness in time of war to take part in the defence of the Bristol area. The squadron's first Hawker Hurricane arrived in early March 1939, and this was one of two similar single-engined monoplane fighters available to the RAF at the outbreak of war, both of which were armed with eight 0.303" machine guns. The Hurricane, which was a very stable gun platform well suited to destroying bombers, had a maximum speed of some 328 mph, while the Supermarine Spitfire, the most advanced of the single-engined interceptors available at the time, was able to achieve a very respectable 355 mph. By mid-August 1939 the main components of the country's air defences were assembled under RAF Fighter Command which for operational purposes was divided into a number of geographical Groups, each sub-divided into Sectors. The Sector Operations Room at Filton was responsible for the local fighters, balloon barrage and searchlights, as well as the anti-aircraft guns which it controlled via the Army's Gun Operations Room at Worrall Road, Clifton. The Sector Operations Room also received information about the movement of hostile aircraft from the Observer Corps and the searchlight sites, while Filton also maintained direct communication with adjacent Sectors, Groups and with HQ Fighter Command.

On August 24th, a general mobilisation took place after which the balloon squadrons started leaving Pucklechurch to occupy their wartime sites, forming skeleton barrages around the vital port facilities at Avonmouth and Bristol. In the next few months, however, two of the squadrons were transferred to Eastern England where their services were more urgently required leaving only one to man both the local barrages. Although a replacement unit was formed at Pucklechurch in December during the winter of 1939/40 balloon production was unable to keep pace

with demand, so it was to be the end of March before the new unit, No. 951 Squadron, was finally declared operational. The heavy anti-aircraft guns had also moved to their war stations by early September 1939, and although initially operating from temporary sites, by late November were emplaced on permanent positions at Easton-in-Gordano, Portishead, Rockingham near Avonmouth, Cribbs Causeway, Brickfields at Winterbourne, and on Purdown. During the ensuing months the mobile guns were exchanged for statics and by the beginning of June 1940 four 3.7" weapons were in place on each of the sites providing the Bristol area with a total of 24 heavy anti-aircraft guns with which to counter the expected raids, far too few as it turned out for so important a target. Following mobilisation light anti-aircraft guns were also set up at the Portishead Electricity Power Station, the Parnall Aircraft plant at Yate and the Bristol Aeroplane Company's premises at Filton. In addition heavy anti-aircraft and searchlight units also installed anti-aircraft machine guns around the local docks. In Bristol they were placed on the Wills Factory, Co-operative Wholesale Society Building, the Bonded Warehouses at Canon's Marsh and Cumberland Basin and on the Bristol Food Concerns premises, while at Avonmouth the guns were set up at the Smelting Works. However, these were to be short term deployments, the guns all being removed by early 1940 when balloon barrages effectively covered these locations. Although the original plan had been to deploy searchlights at intervals of 3500 yards, due to a shortage of money at the outbreak of war only about half the equipment necessary had been delivered and these early shortages forced a 6000 yard spacing in many places. As a result by early October only 24 searchlights had been deployed in the Bristol Gun Defended Area, and it was to be June 1940 before anything approaching the full complement was in place.

In spite of being a home posting, life in AA Command was much more difficult than was generally imagined, particularly by the rest of the Army. The men tended to be deployed in small groups all over the country, many of them under junior NCOs and miles from the nearest habitation and any form of entertainment. As heavy AA gun and searchlight sites were desolate places, the life of the gunners and operators tended to be lonely and monotonous, and after the declaration of war men also had to be in constant and instant readiness, both day and night, with some who had been on duty carrying out maintenance work during the day. To compound the misery the first winter of war was not easy for the men, many of whom were still in temporary accommodation. Snow fell early in December, and about Christmas time a severe frost set in which held well into February causing great hardship to all working on exposed positions. Furthermore for the first nine

months of war no gunners or searchlight operators in the Bristol area had a chance to engage a German aircraft so it became progressively more important to keep the men busy all day with training, maintenance, physical training, arms drill, fatigues and construction work on the camp, for without the incentive of an enemy efficiency could decline quickly.

The only local defenders to see any action during the 'Phoney War' were, not surprisingly, the RAF and their first chance came on November 10th 1939 when No. 501 Squadron was 'scrambled' in an unsuccessful attempt to intercept a German reconnaissance aircraft which was reported in the Gloucester area. This, however, was an isolated incident and as there was now more enemy activity over South Eastern England, the squadron, together with their Hurricanes, moved to that area soon after. A squadron of obsolete Gloster Gladiator biplane fighters replaced them, but these only remained at Filton until April 1940 when they were dispatched to Norway. At this time enemy aircraft approaching Bristol would have first been detected by the single coastal radar station at Ventnor on the Isle of Wight. This was one of a small number of Chain Home, or CH, stations which were able to track aircraft approaching at altitudes of up to 15,000 feet at a range of 120 miles. The next CH station to be opened on the approach route to the city was at Worth Matravers, near Swanage, which came into operation in late May and this was followed later in the year by others along the South Devon coast. Also established were Chain Home Low stations which were capable of detecting approaching raiders at altitudes of below 5000 feet at a maximum range of 50 miles. The first CHL in the West, also installed at Worth Matravers, came into operation in early June, to be followed by others sited in Devon and Cornwall.

Sir Stanley White, the Managing Director of the Bristol Aeroplane Company, wrote to Fighter Command on May 27th requesting that a balloon barrage should be provided to protect the company's works at Filton, although he was well aware of the difficulties this might cause to any fighter aircraft operating from the nearby aerodrome. The response was rapid and two days later White was informed that he would get his balloons, No. 935 Squadron moving immediately from Cardiff to Filton. From the end of May until late September, when a very damaging attack was carried out against the aircraft factories, only a few fighter squadrons were on short term deployment at Filton as the balloon barrage had made the airfield difficult to use as a fighter station by day, and impossible by night. Following the German invasion of France and the Low Countries on May 10th frantic efforts were made to spread the fighter defence westward, and the first new airfield to be occupied was Middle Wallop, in Hampshire. Lying some six miles south-west of

Andover it was ideally sited to intercept enemy aircraft approaching Bristol, and on June 1st the first Hurricanes from No. 601 Squadron arrived, to be followed by the stop-gap twin-engined Bristol Blenheim night fighters of No. 236 Squadron in the middle of the month. Although some of these aircraft, modified bombers, were to be fitted with the new Airborne Interception radar, with a maximum range of about three miles, the equipment was still of relatively low performance and unreliable. In addition the Blenheim, which could only achieve a top speed of about 225 mph in its night fighter form, proved quite inadequate to its task and the combination was to fail to bring any immediate increase in efficiency to the night defences.

The Luftwaffe carried out its first raid on the Bristol area on the night of June 19th just as Filton, as Sector Station, had assumed temporary responsibility for three new fighter airfields which had received their first aircraft the previous day. A squadron of Hurricanes was sent to Exeter, while two squadrons of Spitfires were also deployed, one each at Pembrey, near Swansea, in South Wales, to cover the Bristol Channel and at St. Eval, near Newquay, in Cornwall. German bombers appeared over the area for the second time on the night of June 24th when a Blenheim from Middle Wallop became the first night fighter to operate, albeit unsuccessfully, in the defence of the West. Up until now cloud cover had prevented the local heavy anti-aircraft guns from going into action but two nights later the Cribbs heavy gun site became the first in the Bristol Gun Defended Area to fire in anger, expending two rounds just after midnight, during the course of a nuisance attack aimed at Avonmouth and Portishead Docks.

At this time resources were stretched to the limit, and in an effort to provide some additional form of protection the local day fighter squadrons were also instructed to provide aircraft to fly radarless 'Cats Eye' patrols at night. As a result, a small detachment of aircraft was sent each evening to Hullavington, in Wiltshire, a flying training station from which the first patrol by a single Spitfire was undertaken at the end of June. Despite the sterling efforts made by the pilots flying 'Cats Eye' sorties accidents were not uncommon, and to add to the problems the Hurricanes and Spitfires employed were virtually useless at night unless the target was silhouetted against cloud, so it was pure chance if the fighter was in the right place at the right time. Not surprisingly the first victory for the local fighters came in daylight hours, and this took place on the afternoon of July 4th when three Spitfires of No. 92 Squadron at Pembrey, which were on daytime deployment at Filton, were 'scrambled' to intercept a Heinkel He 111 which had just dropped bombs near the Bristol Aeroplane Company's Rodney Works. A running fight took place

over Somerset before the raider was finally brought down near Gillingham, in Dorset.

In order to counter 'Knickebein', the radio beam navigation and bombing aid then being employed by the German night bombers, a number of jamming transmitters under the control of the Air Ministry were installed in the West. The first temporary equipment became operational at Upavon, in Wiltshire, on July 10th, followed by other installations at Glastonbury Police Station, Temple Combe, Beacon Hill near Salisbury, and Shipham. The counter-measures subsequently proved very successful and deprived the Luftwaffe of a simple and efficient bombing aid, the only one available to the whole bomber fleet. Throughout July improvements were also made to the fighter defences of the West Country, and as part of these Warmwell airfield, near Dorchester, opened as forward operating base for Middle Wallop. A major reorganisation then took place within Fighter Command, the Filton Sector becoming part of a new No. 10 (Fighter) Group, which came into being on July 8th. The establishment of the Group had in fact been contemplated before the war and construction work on the new Headquarters at Rudloe Manor, Box, near Bath, had started in February 1940. From here it was to oversee the defence of the whole of South West England and South Wales during the ensuing conflict, and as part of the scheme two new Sector Stations were quickly established within its area, at Pembrey and St. Eval. Pembrey was replaced by a purpose-built fighter airfield at nearby Fairwood Common in June 1941, while during the course of the war Exeter, which did not become a separate Sector until early 1941, also operated Culmhead (Church Stanton) and Winkleigh as satellites. When No. 10 Group first went into action its commander had four squadrons to divide between his three Sectors, and for some months afterwards he continued to lack any purpose-built Sector Headquarters or sufficiently well equipped aerodromes in suitable locations. Nevertheless the situation was slowly improving and by mid-July another Hurricane squadron, No. 87, newly arrived at Exeter, had joined No. 92 in night deployment at Hullavington.

An interesting experiment also started in mid-July when a detachment of the 354th Searchlight Battery were deployed on the so called 'Dazzle Defence' of Filton, which was designed to 'blind' enemy pilots and bomb aimers so as to make accurate bombing impossible. It consisted of four groups of three searchlights, each not more than 200 feet apart, being placed around Filton, the Master Group being set up on the Brickfields gun position, which was also equipped with a gunlaying radar set for the exclusive use of the searchlights. This special layout was distinct from the tactical searchlight system, its three banks of lights



Men of 238 Battery, 76th Heavy Anti-Aircraft Regiment install a Predictor at the temporary gunsite at Bailey's Court Farm, Stoke Gifford. This was only occupied from 24 August until 5 November 1939 when the equipment was moved to Brickfields, a purpose built site at Winterbourne. (via Ian James)



Between 11 September and 18 October 1939, 238 Battery, 76th Heavy Anti-Aircraft Regiment on short term deployment south of the River Avon in a defence of Avonmouth exercise. Here the men have just arrived at the temporary site in Ashton Park. (via Ian James)

being exposed together with one being held in reserve. For the rest of the year the 'Dazzle Defence' remained operational, but as it failed to provide any tangible results activities were curtailed in mid-December. Although mining of the Severn Estuary had been undertaken by a German submarine as early as November 1939 it was not until the night of July 17th that the Luftwaffe were in a position to commence aerial mining operations in the same waters, and the subsequent inability of the defences to track and intercept the aircraft over the Bristol Channel almost deprived shipping of the use of Avonmouth Docks. To combat this menace the Observer Corps network was immediately extended to cover Devon and Cornwall and further CHL radar stations capable of detecting the low flying He 111s employed were ordered to supplement the lone installation at Carnanton, near Newquay. The anti-aircraft defences of Bristol were also strengthened during July 1940, and by the 10th the manning of eight semi-mobile 3" guns which had been installed on two new sites, at Whitchurch, and Reservoir on Bedminster Down, was completed. An additional five heavy gun positions were also built during the next couple of months, although it was to be some time before the majority of them, located at Avonmouth, Almondsbury, Hambrook, Hanham and Henbury, received any weapons. The summer of 1940 also highlighted a problem which was to plague balloon barrages throughout the war, that of lightning strike during a thunder storm, and locally the most serious incident of this type took place on the night of July 26th when a total of 28 balloons were hit and brought down in flames. By this time the barrage layout around the Bristol area was complete with 32 balloons flying at Avonmouth, 24 at Filton and 40 around Bristol itself.

On August 3rd the boundaries of No. 10 Group increased dramatically, with the incorporation of the Middle Wallop Sector, so important in Bristol's defence, and as the war progressed other satellites came to be used in conjunction with the airfield, including Boscombe Down, Chilbolton, and Ibsley. There remained, however, many problems in carrying out operational night flying alongside flying training at Hullavington, and so in early August the fighters were transferred to the grass airfield at Bibury in Gloucestershire. The first confirmed nocturnal victory followed soon after, when on the night of the 29th a Spitfire of No. 92 Squadron at last succeeded in engaging an He 111 over Bristol, the raider eventually crashing near Fordingbridge, in Hampshire. This, however, was to prove a unique triumph for the local Spitfires which, on account of their unsuitable undercarriage configuration, were withdrawn from night operations soon after, leaving the Hurricanes to soldier on alone, but without any form of radar assistance their chances of

destroying many enemy bombers was remote. More passive forms of defence had also been put into place in the summer of 1940 and these included the camouflage of important buildings and the construction, by the Air Ministry, of dummy airfields for daytime use, and dummy flarepaths designed to confuse enemy bomber crews at night and lure them away from the authentic aerodromes. Not only airfields were decoyed but other 'Key Points' such as aircraft factories and port facilities also needed to be covered, so in August 1940 decoy sites incorporating lights and fires were introduced for night protection. A system of sophisticated lights would operate much as one would expect those of the real target to react, while the decoy fires would be lit only when bombs fell on or near the intended target, at the same time as the real fires were extinguished, in the hope that at least some of the attack might be diverted. In the Bristol area a decoy for Filton was established at Patchway, while others were built at Long Ashton, Severn Beach, Lawrence Weston, and Portbury.

Even though gun laying radar sets had been available for some time their deployment on heavy anti-aircraft gun sites was delayed as attempts were made to provide the equipment with some means of providing an indication of the height of enemy aircraft. Consequently, it was to be mid-August before a set arrived for installation on the Whitchurch position, and similar apparatus, which was able to detect an aircraft at a range of 40,000 yards, was soon after provided for the Gordano and Rockingham sites. As a stop-gap measure in September all three sites received single 150cm searchlights, which gave a beam of 510 million candle power, together with Sound Locators to work in conjunction with their new radar equipment in an attempt to compensate for the lack of an elevation finding facility. Nevertheless, early October did see the first electronic devices capable of determining elevation being made available for fitting to existing radar sets but accuracy was found to vary from site to site. In spite of this drawback it at last made possible reasonably good unseen fire control, and by mid-March 1941 suitably modified equipment was in operation on the Portishead, Brickfields and Whitchurch gun sites. Although the nuisance attacks which the Germans continued to carry out against the Bristol area during the summer of 1940 inflicted little serious damage, they did assist the local defences in perfecting their organisation under combat conditions and this was especially true of the Royal Engineers bomb disposal units. A good example was the successful defusing of 250kg bombs at Congresbury on August 17th and at Temple Street, in Bristol, on September 3rd, by Lieutenant Edward Womersley Reynolds whose bravery in rendering safe weapons on which he had not been trained was rewarded on September 17th with the award of the

OBE (Military), a medal which was automatically replaced by the newly introduced George Cross seven days later. Nevertheless, the task of bomb disposal was always hazardous and the first local fatality suffered by No. 7 Bomb Disposal Company occurred on September 10th when an officer was killed at their Shirehampton Depot whilst handling a German fuse.

September also saw the official establishment of RAF Colerne, an old maintenance airfield lying some five miles north-north-east of Bath which had been re-built as a fighter Sector Station to replace Filton. However, as the runways were still incomplete, heavy rain was to render the aerodrome unusable for some months to come, which with the other constructional problems encountered meant that it was not until late April 1941 that Colerne actually took over Filton's Sector responsibilities. This was to have a serious effect on the local defence capability, especially during a large scale raid carried out on the morning of September 25th against the Bristol Aeroplane Company at Filton. Things, however, started well for the defences for as the attack force were on their run-in towards the target an He 111 was engaged by the Portishead gunsite and hit by their initial salvo, the bomber subsequently crashing at Failand, the first of only two enemy aircraft to be brought down by Bristol's anti-aircraft guns during the war. Nevertheless, the other raiders reached and successfully bombed the plant, killing 91 BAC employees, causing a serious delay to the development of the Bristol Beaufighter, a new and desperately needed night fighter, as well as scoring direct hits on a barrage balloon site at Filton and a 'Dazzle Defence' searchlight site at Stoke Gifford, killing an operator at each location. Due to confusion in defence and a lack of locally based fighters the bombers were not intercepted by the main force of Hurricanes and Spitfires until after the attack had taken place. Although the RAF were subsequently responsible for bringing down seven enemy aircraft, for the loss of just one British pilot, it did emphasise how important it was for a day fighter squadron to be permanently based in the immediate vicinity of Bristol, none having been so deployed since April.

The tragedy at the BAC works brought about a rapid review of its defences and the very next day No. 504, flying Hurricanes, arrived from Croydon to take up residence at Filton, while in order to improve the heavy anti-aircraft gun cover for the factories on the 27th the eight 3" semi-mobile guns were transferred from the Whitchurch and Reservoir positions to Henbury and Almondsbury. This move proved most providential for on the morning of the 27th the Germans attempted a pinpoint attack on the Parnall Aircraft plant at Yate, the raiders being successfully intercepted over Bristol by the newly arrived aircraft. In the course of this action two Messerschmitt Bf 110s crashed locally, at

Radstock and Fishponds, while a further eight were destroyed by other squadrons on the return flight, during which a British pilot died in a mid-air collision with a German aircraft. With unsustainable losses being suffered during daylight attacks on Britain, in mid-October the Luftwaffe made the decision to switch to much safer, but less accurate, large scale night bombing. As the only real hope of combating this menace now lay with the new Beaufighter, the 'Shadow Factory' dedicated to its construction which was then being built at Oldmixon, near Weston-super-Mare, assumed great importance and at the end of October received interim protection in the form of anti-aircraft machine guns, while a decoy site was established nearby at Bleadon.

During early November 1940 the German High Command ordered that the night raids were to be directed against Britain's manufacturing centres, to be followed by a concentrated assault on the ports as part of the policy of blockade, the attack sequence opening with a heavy raid on Coventry on the night of November 14th. By this time the Germans had introduced a new radio beam bombing aid known as 'X-Verfahren' and this was now being used by the pathfinder aircraft detailed to take part in the night attacks. The British radio counter-measures organisation had, however, responded quickly to the new threat and in early November a temporary jammer had been brought into use at Birdlip, in Gloucestershire, in an attempt to render the signals from 'X-Verfahren' unusable in the Bristol area, while more permanent equipment was later installed at Shipham, Beacon Hill, and Porlock. Nevertheless, these counter-measures proved to be relatively ineffective, and in contrast to the success obtained against the earlier 'Knickebein' system, 'X-Verfahren' remained largely unhindered throughout the winter of 1940/41.

The attack on Coventry highlighted the urgent need to attract enemy bombs away from targeted towns and cities, not only to protect the civil population and industry, but also to keep up morale. This led, later in the month, to the introduction of 'Special Fires', the idea being to disguise the effect of radio counter-measures activity by starting the fires, in what might appear to an enemy to be his target area. To cover this plan the 'Special Fires' were code-named 'Starfish' on December 10th. A number of sites were constructed locally, the first serving Bristol being laid out at Stockwood and Chew Magna. Additional installations were authorised soon after to provide further protection for the city, and these were set up at Downside near Brockley Combe, Kenn Moor, on Black Down near Cheddar, and Yeomouth near Kingston Seymour. In order to concentrate the light from the somewhat inadequate 90cm projectors in November it was also decided that searchlights would in the future be deployed in

clusters of three at intervals of 10,400 yards to be controlled from the new Searchlight Operations Room at Colerne and, in order to achieve this, over the next few months the whole local searchlight layout in Southern England was altered.

Bristol's first large scale night raid took place on the night of November 24th when 135 bombers attacked the harbour installations for the loss of just two aircraft. None of these, however, were accounted for by Bristol's heavy anti-aircraft guns which fired a total of 3404 rounds, or by locally based fighters, although a Hurricane of No. 87 Squadron inconclusively engaged an He 111 illuminated in a searchlight over the city. During the attack balloons in the Bristol barrage fared badly with some 15 either being set adrift or brought down with damage caused by bomb splinters, while one operator was also killed by a high explosive bomb which scored a direct hit on a balloon site. A total of 337 suspect devices were subsequently reported and, after inspection by personnel from the City Engineer's Department and sappers loaned from the Royal Engineers, 175 unexploded bombs were left to be dealt with by the recently re-trained No. 853 (Quarrying) Company RE which was to be responsible for bomb disposal in the Bristol area for the next few months! This raid, engraved on the minds of Bristolians who lived through it for the amount of damage caused, was responsible for the death of some 200 people, injuring a further 890 and rendering 1390 homeless. It at last highlighted the complete inability of the local air defence system to protect the city from Luftwaffe bombers, and this was not helped by the fact that the 'Starfish' decoy sites had not been fired as the expert responsible could not be found. Nevertheless, the following night, during a small scale raid on Avonmouth, the first 'Starfish' operation in Britain took place when the Chew Magna decoy was successfully lit, but unfortunately it failed to attract any bombs. Shortly after a Flight of Hurricanes from No. 87 Squadron transferred from Exeter, via the still unserviceable airfield at Colerne, to Charmy Down its satellite located just north of Bath, where the concrete runways were to prove their worth in the coming winter. The other half of the squadron finally moved down from Bibury in mid-December, and for the first time in six months the unit, which was now to be used solely for night fighting, had the opportunity of operating together.

The next major raid on Bristol occurred on the night of December 2nd when 121 German crews claimed to have attacked the city. On this occasion poor weather prevented much fighter activity, and although Bristol's heavy guns fired 4556 rounds no enemy aircraft were destroyed. During the course of the raid a high explosive bomb fell some ten yards from a Lewis gun emplacement on the Purdown heavy gun site

wounding seven men, two of whom were seriously injured, one fatally, the first death from enemy action suffered by Bristol's anti-aircraft gunners. On a more positive side, damage to the balloon barrage was considerably less than on November 24th and amounted to just four envelopes punctured by bomb splinters and two operators slightly injured, while Bristol's two decoys were also lit, Stockwood drawing 62 bombs and Chew Magna a further six. As a result of the first two serious attacks on Bristol it was felt that certain modifications should be made to the heavy anti-aircraft gun layout and so, in order to allow more guns to fire linear barrages over the south of the city, in mid-December four 3.7" mobiles were sent to the then empty Whitchurch gun site. At this time a new experiment in night defence was proposed in which Handley Page Hampden bombers based in Lincolnshire were to fly defensive patrols for the close protection of a number of industrial centres, including Bristol. The operation of these 'Hampden Patrols' required the improvised night fighters to fly for four hours within a radius of ten miles of the centre of the target city, with each aircraft flying at a selected altitude between 12,000 and 20,000 feet. During this time it was also arranged that no anti-aircraft guns were to engage, or searchlights expose in the patrol area.

Only one operation was in fact ever flown over Bristol, this taking place on the night of December 6th when 67 German crews claimed to have attacked the city. Once again no enemy aircraft were destroyed by Bristol's defences although the heavy guns fired a total of 1013 rounds and the Stockwood decoy drew 73 bombs. For a second time a high explosive bomb impacted on a local gun site, this time Brickfields, where it exploded under the concrete foundations. One gun, which had been firing a few moments before, was put out of action, but casualties were luckily restricted to only two men injured. As the 'Hampden Patrols' experiment was not proving successful it was terminated eight days later, after the decision had been made to introduce concentrated patrols of 'Cats Eye' single-engined fighters stepped up in layers over certain cities. The plan was that once the objective was known, between twelve and twenty fighters would be ordered up to patrol above the target at a minimum of 14,000 feet, and each was to be given a specific altitude at which to fly, so as to provide a reasonable separation between aircraft. The system was initially code-named 'Operation Layers' but in April 1941 was renamed 'Fighter Nights'.

The New Year opened locally with a large scale attack on Bristol by 178 aircraft on the night of January 3rd, during which 'Operation Layers' took place for the first time. In spite of such a large number of enemy aircraft operating the sole claim of a Junkers Ju 88 damaged at 21,000

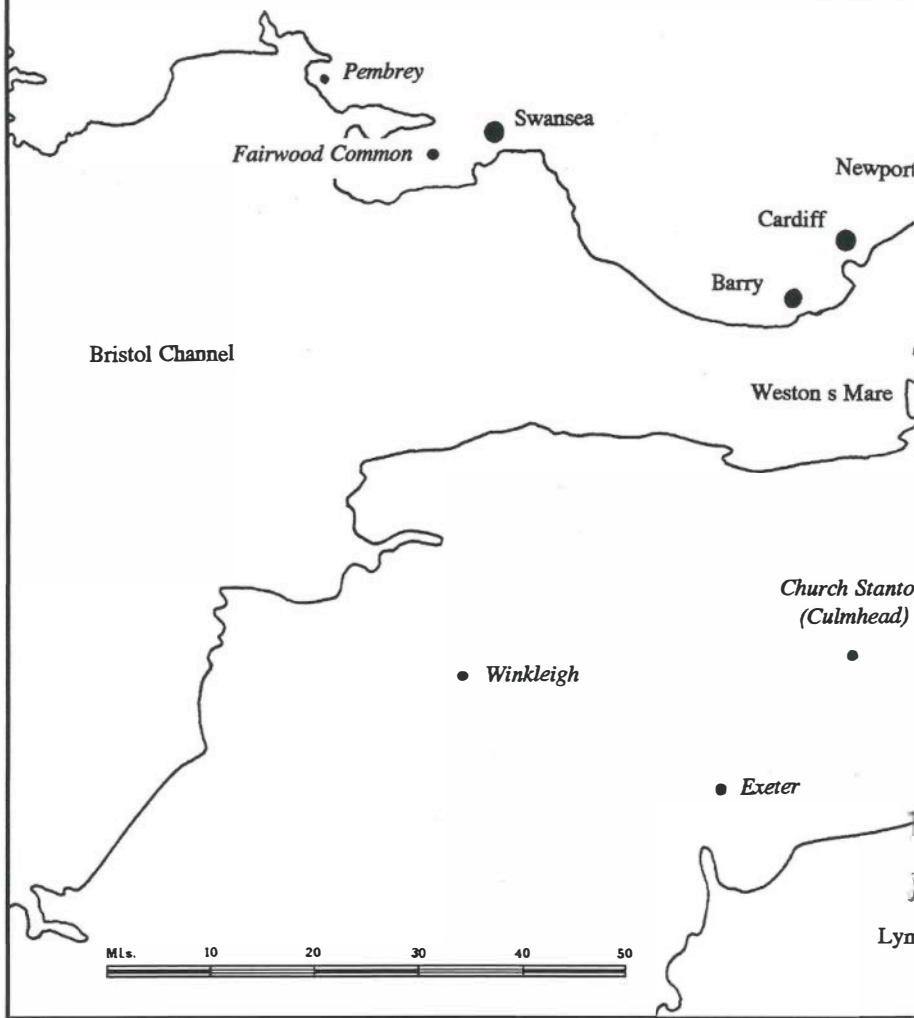
feet over the city by a Hurricane of No. 87 Squadron was as near as the fighters came to success. The heavy anti-aircraft guns fared no better and in spite of expending 1317 rounds no raiders were brought down. Local decoys were also fired and while the Chew Magna 'Starfish' collected six high explosives and about a thousand incendiaries the Stockwood site failed to attract any bombs at all. The following night 103 bombers made for Avonmouth, but the raid failed to develop, instead spreading itself down the North Somerset coast, past Clevedon and on to Weston-super-Mare, where 34 people were killed. In response the Bleadon decoy was activated, but as the ignition switches failed to operate an airman lit the dummy buildings by hand, immediately attracting the bombers which dropped hundreds of incendiaries and a number of high explosive bombs on the site. As a result of this courageous action, on March 7th 1941, AC2 Cecil Frederick Mason Bright was awarded a well deserved Military Medal.

A most important improvement in the defensive capability took place in early January when the first local medium range precision Ground Controlled Interception radar station came into operation at Avebury, in Wiltshire. GCI stations, which were designed to guide the pilot of a Beaufighter to the general vicinity of a raider, quickly proved successful and other sites were subsequently opened at Sopley, near Christchurch, in Hampshire, and at Durrington, near Worthing, thereby effectively covering the Luftwaffe's main approach routes to Bristol. In March 1941 the Avebury station was moved to Exminster to extend GCI coverage to the South Devon area, and the local network was further improved by the construction of additional stations at Wrafton, in North Devon, to protect the Bristol Channel, and at Long Load, near Somerton, and at Sturminster, in Dorset. The Beaufighter, brought into service to replace the obsolete Blenheim, had a maximum speed of 323 mph, carried the unprecedentedly heavy armament of four 20mm Hispano cannon and six 0.303" machine guns, and to compound its effectiveness was fitted with the latest Airborne Interception radar which made it possible to track targets to a minimum range of 140 yards. Although the first of these twin-engined aircraft had been delivered to the famous No. 604 Squadron at Middle Wallop in early September 1940 re-equipment was slow, partly due to the raid on the BAC factory at Filton, so that by the end of the year only seven examples had been received.

Nevertheless, the new GCI system enabled the Beaufighters to operate in zones off the South Coast and on the approaches to Bristol, so leaving the locally based Hurricanes free to fly 'Layers' over the threatened city. However, only three 'Operation Layers' were in fact flown in January, including two over Bristol, the second being on the night of the 16th

THE TARGET AND ITS FIG

Bristol =
Colerne =



WATER DEFENCES 1940-1944

Towns
Airfields



during an attack on Avonmouth when twelve Hurricanes were operating, these being drawn from No. 87 Squadron at Charmy Down and the locally raised No. 501 Squadron, back at Filton since mid-December. Results were disappointing, and to add to the problems the absence of anti-aircraft gun fire while the fighters had been patrolling over the city had caused widespread comment and discontent among Bristol's population. Nevertheless, during the night the local heavy guns had expended 2943 rounds, and 28 high explosive bombs which might otherwise have fallen on populated areas were attracted by the Chew Magna 'Starfish'. The Avonmouth balloon barrage, however, had a particularly bad night, a high explosive bomb scoring a direct hit on one of their sites causing the death of three balloon operators, and injuring seven others.

On January 18th the weather worsened sharply, with clouds and snow prevailing, and consequently the Avonmouth raid proved to be the last heavy attack on the locality for some time. Shortly after No. 853 Company RE reported that since the 'Blitz' began in November 1940 the unit had attended approximately 500 unexploded bomb incidents, most of these in the Bristol area, with the greatest concentration within the city boundary, where not one bomb had been blown up *in situ*, all being removed safely to the Bomb Cemetery in Ashton Park. This was a considerable achievement, especially as the unit had only been engaged in the exacting science of bomb disposal for three months! On January 20th the first Beaufighter came off the production line at the Oldmixon 'Shadow Factory' and to provide additional protection for this increasingly vital production facility in late February four 3.7" mobile heavy anti-aircraft guns were installed on two of Weston's new gun sites at Uphill and Hutton. The weapons were to be used, not only to protect the factory, but also against raiders approaching Bristol from the south-west and aerial minelayers attempting to block the approaches to local ports. A balloon barrage was also installed but it was to be early May before No. 955 Squadron had all 24 balloons deployed around the factory. Bad weather on the continent ensured that Bristol remained relatively free from attention by the Luftwaffe during February and early March, although a few hand-picked crews did attempt lone 'pirate' attacks against the Parnall Aircraft factory and the Bristol Aeroplane Company's plant at Filton. February also provided a good demonstration of how much more dangerous the barrage balloons were to 'friendly' aircraft than to the Germans, when on the 21st a Hurricane of No. 501 Squadron flew into a balloon cable at Patchway, causing the aircraft to crash 500 yards from the site and killing the pilot. Although this was the first such incident involving barrages in the Bristol area it was, sadly, not

the last and the local balloons were to give both regular and ferry pilots cause for concern until their removal in the summer of 1944.

Early in the afternoon of the following day a single He 111 making for Parnall Aircraft at Yate was seen flying at 600 feet over the Portishead Power station. It was immediately engaged by the Gordano gun site which loosed off eight rounds, causing the raider to reduce altitude and strike a nearby barrage balloon cable before crashing on Portbury Wharf, the second, and last, enemy aircraft brought down by Bristol's heavy anti-aircraft guns during World War Two. A second attempt against the Parnall factory was made by the Luftwaffe on the afternoon of February 27th 1941, but on this occasion the raider reached its objective unharmed and during the course of a low level attack caused severe damage and loss of life at the plant. Nevertheless, as the bomber was leaving the Yate area the light anti-aircraft gunners protecting the factory managed to loose off eight rounds of 40mm and 40 of 0.303" and although they succeeded in knocking out its port engine the Heinkel eventually limped back to base. This was, however, the nearest the local light guns came to bringing down an enemy aircraft during the course of the war.

Since just before Christmas 1940 the RAF had been carrying out long-range night fighter patrols, known as 'Intruder' missions over German airfields in France in an attempt to intercept enemy bombers returning from raids on Britain and to destroy any aircraft seen on the ground. At first radarless Blenheims were employed, but it was soon decided that the Hurricane, which was having little success flying 'Cats Eye' patrols, might be better suited to this work, at least against airfields relatively close to the French coast. It was not surprising, therefore, that the first squadron selected for this work was No. 87 at Charmy Down, which had been specialising in night flying since the summer of 1940. They flew their first 'Intruder' sortie on the night of March 15th 1941, and with the arrival of the first Hurricane IIC fighter/bombers in July, the pilots had at their disposal a type they considered ideal for the work. During the first half of March the Bristol heavy gun layout had also been enlarged with the deployment of an extra eight 3" semi-mobile and twenty 3.7" mobile guns on the existing sites at Almondsbury, Avonmouth, Hambrook, Henbury, as well as on three new positions at Blackboy Hill, Ashton Park, and Failand. This was to prove a timely move, for on the night of March 16th Bristol was subjected to an attack by 167 enemy aircraft during the course of which the city's heavy guns fired a total of 2370 rounds. As the weather was very poor only nine fighters were able to operate, nevertheless, a Beaufighter from No. 604 Squadron did succeed in damaging an He 111 over Dorset, the raider

subsequently crash-landing at an airfield near the French coast, while two of the city's 'Starfish' sites were ignited, Downside collecting 74 high explosives and about 1500 incendiaries. The local bomb disposal company also had a busy time and of the 102 suspect devices reported, 51 were confirmed, including five delayed action weapons. By contrast, only five balloons in the Bristol barrage were either brought down or set adrift, and an operator injured by an explosive incendiary. Poor visibility over the target caused the attack to drift into the 'working class' suburbs of east Bristol, and as a result this was the city's worst raid with regard to loss of life, some 257 people being killed. However, some of these doubtless died as a result of the premature 'All Clear' which was sounded at 01.40hrs, and although a second 'Alert' was signalled some eleven minutes later people had already started to come out of their shelters, only to be greeted by falling bombs. As no official explanation was ever forthcoming, soon after rumours started to circulate that either the anti-aircraft gun sites had run out of ammunition, a cease-fire had been ordered or that the guns had stopped firing to allow locally based fighters to operate over the area.

Further changes to the layout of the heavy guns around Bristol also took place after the raid, with three 3.7" mobiles being put in place at the new Rodway site on March 26th, the same day on which Colerne airfield received its first operational unit, No. 307 (Polish) Squadron operating single-engined Boulton Paul Defiant night fighters equipped with a turret containing four 0.303" machine guns. By this time a turning point had been reached regarding the RAF's night fighting capability and from then on Luftwaffe losses during nocturnal raids steadily mounted, principally as a result of introduction of the GCI system. During April and May No. 604 Squadron, which under the command of the legendary Squadron Leader John Cunningham went on to become the highest scoring night fighter squadron in the RAF, succeeded in destroying 30 enemy aircraft, including three He 111s engaged in raids on Bristol. No. 600, another Beaufighter squadron then based at Colerne, also began to score regularly, shooting down a Ju 88 and an He 111 before the end of the April and two He 111s early in May.

Nevertheless, the German air attacks against the Bristol area continued during April with some 76 bombers reporting over Avonmouth on the night of the 3rd. In defence, Fighter Command flew 73 sorties, during one of which a Beaufighter from No. 604 Squadron shot down a Ju 88 off the Isle of Wight, while the Downside 'Starfish' site drew 25 high explosive bombs. Bristol's heavy guns were also in action firing 3327 rounds, although five small bombs fell across the Gordano site where a hut was hit killing one man and injuring five others, as well as

destroying a height finder and damaging two guns and some ancillary equipment. Furthermore, the balloon barrage at Filton and that at Bristol lost a balloon each punctured by anti-aircraft shell splinters. The following night 85 aircraft again made for Avonmouth, but the defenders' success continued with yet another victim falling to the guns of a Beaufighter of No. 604 Squadron, the unfortunate Heinkel crashing to earth at Hewish, near Weston-super-Mare. The anti-aircraft defences expended even more shells than on the previous night with a total of 6450 rounds being fired by Bristol's guns, but the cost was high, some three gunners losing their lives. One man was killed and seven injured at Purdown when a gun fired prematurely, while a bomb landed on the Brickfields gun site where two men were killed. The 'Starfish' decoys were also in operation and Downside drew ten high explosive bombs, while the balloon barrage escaped lightly with only one envelope being punctured by shrapnel and some huts damaged at Avonmouth.

Modifications to Bristol's anti-aircraft gun layout continued to be carried out and on the 8th three 3.7" mobiles moved to take up position at another new site at Lodge Farm, near Portishead. Four 3.7" mobiles earmarked for the other additional site at Pilning were not deployed until the end of the month and were therefore not in place before Bristol's last large scale attack, the so called 'Good Friday Raid', took place on the night of April 11th. On this occasion the Germans claimed 153 bombers attacked the harbour installations at Bristol, Avonmouth and Portishead during the course of an operation which saw the local anti-aircraft guns, including Weston's, fire 6765 rounds and the balloon barrage around Bristol and Filton suffer 14 balloons damaged by shrapnel. To combat the intruders Fighter Command flew 39 sorties which resulted in an He 111 being shot down over Dorset by a Defiant of No. 307 Squadron from Colerne, a Hurricane of No. 87 Squadron from Charmy Down destroying a Ju 88, and the Beaufighters of No. 604 Squadron at Middle Wallop bringing down two He 111s and a Ju 88. The local 'Starfish' sites were also successful and drew a total of 34 high explosives, while in the city more than 100 suspect unexploded devices were reported, including more delayed action bombs than in any other raid, one of which tragically claimed the life of an Army bomb disposal officer. During the early spring of 1941 the Royal Navy's own Bomb Disposal Section at Avonmouth was also kept busy and was twice called to deal with unexploded bombs in ships which had been removed to the special berth in Portishead Dock reserved for vessels which were in a dangerous condition. The first incident involving a ship carrying phosphates was dealt with easily, but this was followed by a bomb aboard the American tanker *Chesapeake* which was loaded with high octane aviation fuel. A

couple of days were spent pumping out the petrol after which the Commanding Officer, alone and wearing a wooden helmet attached to an airline to protect him from noxious fumes, went down into the hold and succeeded in defusing and removing the offending bomb. For this act of heroism on February 28th 1942 Temp. Lt. Hugh Verschoyle Cronyn RNVR was eventually gazetted with the George Medal.

By the spring of 1941 a new Searchlight Control radar had been introduced the equipment being fitted to the light projector itself. With a maximum detection range of about eight miles on a twin-engined aircraft, SLC was used before the light was switched on to accurately align the projector on its target. At the end of April some ten sets were deployed locally, with further equipment becoming operational early in May. Meanwhile, the local balloon barrage was still causing problems and the most serious incident involving a 'friendly' aircraft occurred on the night of April 30th 1941 when a Wellington bomber on a training flight from Cambridgeshire became lost. It subsequently collided with two balloon cables around Bristol's St. Andrew's Park, where the aircraft crashed killing three of the crew, injuring three others and a balloon operator on the ground. At this time the anti-aircraft gun layout around Bristol was yet again under review, this time with the object of engaging enemy aircraft further out from the existing Gun Defended Area. To this end, early in May, the Failand position was moved to Backwell and that at Ashton Park to Chew Stoke, while two additional sites were also planned at Gaunt's Earthcott and Henfield. Some of the previously used positions were then abandoned and others re-named. As a result of this reorganisation for the rest of the war 20 gun sites were maintained around the city, and were henceforth known as Portbury (Portishead renamed), Lodge Farm, Gordano (re-named Markham in June 1944), St. George's (Avonmouth renamed), Cribbs, Westbury, Rockingham, Pilning, Almondsbury, Earthcott, Brickfields, Henfield, Purdown, Rodway, Hanham, Keynsham, Whitchurch, Chew, Reservoir and Backwell. Although German bombers continued to carry out raids against Bristol during May, June and early July 1941, they were only relatively small scale affairs undertaken mainly by aircraft unable to locate their targets in the Midlands and North of England. Nevertheless, during one of these, on the night of May 7th, four balloon operators from the Bristol barrage were injured, one fatally, by a bomb which fell on one of the sites, while the city's barrage suffered a further fatality on the night of July 11th when two parachute mines were dropped near Victoria Park, Bedminster. In the Autumn of 1940 the Ministry of Home Security had decided that smoke screens should be provided to cover vital targets such as munitions factories, dams and ports and personnel of the Pioneer

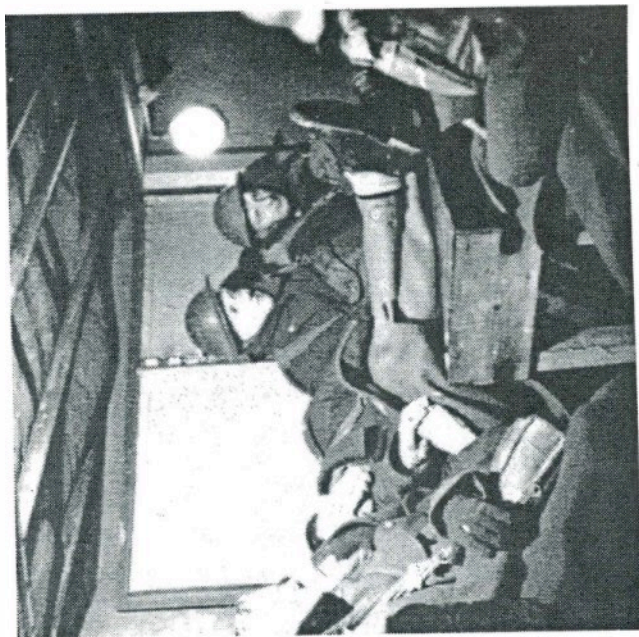
Corps had been selected to undertake the task. In October the first Smoke Companies were formed, but it was to be June 25th 1941 before No. 810 (SM) Company arrived in the Bristol area to operate a screen around Avonmouth Docks. Two types of smoke generator were used, the old No. 24 Mark II and the newly introduced Haslar. The Mark II, known as the 'smoke pot', was a small and entirely static piece of equipment fitted with tall chimneys and operated by hand. It used Pool Diesel Oil and had a burn time of 5 hours, hence the fact that they were arranged in pairs to cover up to 10 hours of operation. By contrast, the Haslar was mounted on a trailer and towed by a lorry, the complete installation being sent each night to the required location. Haslars produced biscuit coloured smoke by means of partly burnt oil enclosed in a film of water which was comparable in colour, nature and consistency to a London fog and were able to produce some 50 times the quantity of smoke generated by the Mark IIs. The Avonmouth Smoke Screen, which was first used early on the morning of July 5th, was made up of an Outer Circuit of up to 45 Haslars arranged on a radius of about 1500 yards around the target and an Inner Circuit formed by 2510 Mark II generators installed about 1000 yards out from the target, notably along the Portway, Portview Road and St. Andrew's Road, with the individual generators spaced in pairs at intervals of around 5 to 10 yards. This Inner, or 'quick cover', Circuit was lit instantaneously by exploders and provided a satisfactory screen during the interim period whilst the smoke from the Haslars joined up and covered the target. However, not all the generators were in use at any one time, as only that part of the screen lying within 60 degrees either side of the predicted wind would be utilised.

During their operations against Britain the Luftwaffe also made use of radio beacons located in France to assist aircraft navigation, and even against these radio countermeasures were employed. Instead of straightforward jamming, it was decided to receive and then re-radiate each individual beacon's signal from a transmitter located in Britain, thereby effectively falsifying the beacon's position. The transmitters involved were known as Masking Beacons or 'Meacons', the first having been installed in the region at Temple Combe in late August 1940, with an associated receiving station at Kington Magna. This was followed by a transmitting and receiving station opening at Highbridge in November, the transmitter from which was transferred to a separate site at Lymphsham in March 1941. Success came some months later when, on the early morning of July 24th the Lymphsham transmitter, then re-radiating the Brest beacon, caused a Ju 88 which had been on a mission to Birkenhead to land undamaged at RAF Broadfield Down, better

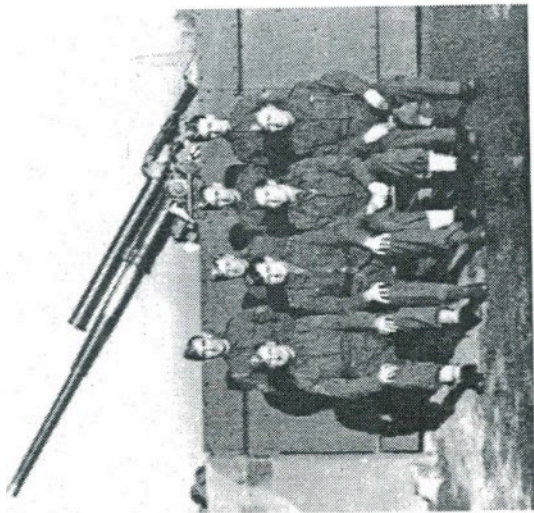
known today as Bristol's Lulsgate Airport, which at that time was still under construction.

By late July the majority of Luftwaffe units previously engaged in operations over Britain had moved to the eastern front and were locked in combat over Russia, leaving only a few odd formations, mostly composed of anti-shipping aircraft, to continue the holding campaign against Britain. However, it was not realised at the time that the bombers would never again return to Bristol in force, so the defences were constantly improved during the next three years, one of the first upgrades made involving the replacement of the original gun laying radar with superior sets which had a maximum range of 50,000 yards. During July and August this equipment was installed on the Portbury, Gordano, Pilning, Rodway, Keynsham and Whitchurch positions, and although it was a great improvement on the earlier versions difficulty was still experienced when following targets that took evasive action, a problem which was not solved until the introduction of microwave radar in 1943. During September the construction of the first rocket firing 'Z' sites in the Bristol area, to be manned by the 9th Anti-Aircraft 'Z' Regiment, had been completed at Easton-in-Gordano, which was positioned to cover Avonmouth Docks and at Bishopsworth for the defence of Bristol Docks. A further four sites were also planned, but only two of these, at Brislington and Ashton Park, later re-sited at Abbots Leigh, were ever completed. The weapons themselves, known as Unrotated Projectiles or UPs, being launched in salvos of 128 to a maximum height of 19,000 feet, using 64 twin-projectors per site. The 'Z' batteries were well suited to firing barrages but the locations and discharge directions had to be carefully chosen to minimise the danger from falling tailpipes. Although by the end of September Easton-in-Gordano was fully armed, and both sites equipped with gun laying radar sets, it was not until early March 1942 that the last ten Twin UP projectors arrived at Bishopsworth.

In the late summer of 1941 the GCI stations in operation were only capable of directing one night fighter at a time, and as an interception took about ten minutes, the system could easily become saturated. To enable more aircraft to go into action against the massed raiding forces that were expected to return that winter, a new system to direct fighters to their target was introduced using the searchlights, many of which were now radar controlled. In September it was ordered that they were henceforth to be deployed as single lights arranged in 'Indicator Belts', using low powered projectors on a 10,500 yard spacing and in 'Killer Belts' with high powered projectors on a 6000 yard spacing, the necessary declustering being completed by late November. The 'Indicator Belts' along the South Coast pointed out the incoming raiders before they entered the 'Killer Belt' where, to protect the Bristol area, the



Inside No. 3 Gun Pit at Portbury where men of 236 Battery, 76th Heavy Anti-Aircraft Regiment stand by during the heavy raids of the winter of 1940. (via Ian James)



Men of 236 Battery, 76th Heavy Anti-Aircraft Regiment at the Portbury gunsite pose in front of a gun pit containing a 3.7" weapon. This photograph of some of Bristol's Territorial Army defenders was taken in 1940. (via Ian James)



Personnel of the 71st (Glos) Heavy Anti-Aircraft Home Guard Battery helped to man the sites at Purdown, Reservoir (Bedminster Down), Whitchurch, Eastfield (Westbury) and Hanham. Here a section pose in front of a 3.7" gun a month before the unit disbanded in November 1944. (via Ian James)

Colerne Sector had five RAF fighters orbiting vertical searchlight beams which acted as beacons, these lights depressing and pointing the interceptors towards their assigned targets as the enemy bombers approached. Code-named 'Smack', this procedure was to operate in parallel with the GCI system for the remainder of the war and was of great help to the night fighters.

Throughout the war Anti-Aircraft Command tended to be treated as a reserve for the Army in general, with men constantly being transferred to other formations and theatres of operation, a good example of this being the local 76th Heavy Anti-Aircraft Regiment which started its move from the Bristol area to North Africa in November 1941. In an attempt to maintain manning levels it was therefore decided to recruit women from the Auxiliary Territorial Service to form 'mixed' batteries made up of both men as well as women, who would carry out nearly all the duties done by the men except actually firing the guns. As a first step towards this on September 22nd the 133rd (M) Heavy Anti-Aircraft Regiment had been formed at Clifton, and shortly after women were assigned for service on some twelve heavy anti-aircraft sites around Bristol. At first there was considerable anxiety as to how the men and women would work together, but as it transpired there was none of the musical-comedy-chorus atmosphere which had been anticipated in some quarters. Although in a 'mixed' battery the women tended to undertake the lighter work this did not lead to much sex-antagonism, and far from resenting the ATS presence the men in the 'mixed' batteries were often the first to defend them against their critics. The use of women was also extended to the 'Z' batteries, while female crews from the Women's Auxiliary Air Force took over the responsibility for a number of barrage balloon sites around the city, but not before the somewhat crude living conditions often associated with these had been improved. Nevertheless, the WAAFs still had to endure the weather as well as the danger of attack from the air, and although theirs was one of the hardest jobs undertaken by women during the war, they carried out the complicated balloon operations with all the ease and efficiency of men. Searchlights, however, posed more problems and although one wholly female searchlight regiment had been formed in Britain (with the odd happily-married mature man secretly provided to hand crank the massive diesel-engined generators), it was soon realised that it was totally impractical to employ 'mixed' manning on the remote and spartan searchlight sites which existed in most parts of the country. Consequently the 68th Searchlight Regiment, responsible for the projectors deployed in the Bristol area since November 1941, remained a 'men only' unit for the rest of the war.

In early January 1942 the last planned fighter airfield in the area was also being completed, and although originally christened RAF Broadfield Down, the name was changed to Lulsgate Bottom before it officially opened in mid-January. By this time, however, the air war was receding from the West Country, and with Colerne and Charmy Down providing adequate cover for the area, another local fighter airfield was unnecessary. No operational units were therefore based there, and in June the aerodrome was taken over for flying training purposes. The beginning of the year also saw the start of a bizarre experiment involving the Hurricanes of No. 87 Squadron working in co-operation with radar equipped Havocs and Bostons of No. 1454 Flight which carried an airborne searchlight in the nose. It was hoped that the Havocs would be able to illuminate the target with a powerful light, known as 'Turbinlite', while a Hurricane flying in formation shot down the enemy bomber. This idea was fraught with difficulties, but the first patrol by a Havoc and Hurricane combination was flown in late March. However, despite increased operations in the summer the Havocs and Bostons at Charmy Down were only able to make four unsuccessful contacts.

The Bristol area had been free from attacks, save for a few stray mines intended for the Severn Estuary, since the summer of 1941 but in late April 1942 a series of reprisal attacks, known both in Britain and Germany as the 'Baedeker Raids', started with two attempts against Exeter, which was followed by attacks on Bath on the nights of April 25th and 26th. The Brislington area of Bristol was hit in error during the first raid, which also saw Bristol's 'Z' sites go into action for the first time, firing a total of 38 UPs. In addition the Avonmouth smoke screen was ignited during the night but an enemy aircraft dive bombed and machine gunned a Haslar generator and its towing vehicle, both of which were put out of action. As a result of the raids, on April 27th eight 3.7" heavy anti-aircraft guns were deployed near Bath, four at Lansdown Park and the remainder at South Stoke, and although no balloon barrage was provided a temporary 'Starfish', was set up at Wellow during May. During the spring of 1942 the local bomb disposal unit also suffered a third fatality when a 250kg bomb was being burnt out in the Ashton Park Bomb Cemetery, one of the surprisingly few deaths suffered locally as a result of this dangerous work. Although ATS manning had done much to keep the anti-aircraft units up to strength, even this source was now starting to dry up. Attention therefore turned elsewhere and April saw the start of the recruitment of Home Guard personnel to man the 'Z' sites at night. As a result, by the end of the year No. 101 and 102 Home Guard Rocket Batteries were attached to the Easton-in-Gordano and Bishopsworth 'Z' positions, while 103 and 104 were deployed on the newly opened sites at Brislington and Abbots Leigh. A large number of

men, however, was required for it was unrealistic to expect those who were putting in long hours in their work places to stand by night after night. A rota was therefore organised which required teams of personnel to be on duty once every so many days. This meant a Home Guard battery required a great deal more manpower than an equivalent regular unit.

During May 1942 the Germans flew a number of sorties against specially selected targets on cloudy days using experimental versions of their electronic guidance and bombing aids. To counter these Fighter Command decided to employ radar equipped night fighters, and so it came about that the Beaufighter, already very successful in the night fighting rôle became the precursor of the radar equipped all-weather fighter of later years, the first victory coming on an overcast afternoon late in the month when an He 111 briefed to attack Avonmouth Docks was forced to crash into the ground near Shaftesbury by a Beaufighter from No. 604 Squadron. Daylight operations over Southern Britain from then on became almost impossible for the Luftwaffe and in an admission of defeat, in early 1943 they switched to flying night photographic sorties over the region with all the difficulties that entailed. Meanwhile, the wooden De Havilland Mosquito, a new type of night fighter equipped with the latest Airborne Interception radar, four 20mm Hispano cannon and four 0.303" machine guns, had entered service with Fighter Command. This twin-engined aircraft with a top speed of 370 mph and a performance considerably better than that of the Beaufighter, was delivered to No. 264 Squadron at Colerne during May and quickly became operational, the first claim being a Dornier Do 217 damaged during an attack on Weston-super-Mare on the night of June 27th.

By the end of July 1942 the 'Baedeker Raids' had petered out, the attack force having been considerably depleted. However, a few examples of the very high altitude bomber, the Junkers Ju 86R, became available to the Luftwaffe in France from where they carried out a number of experimental attacks on Britain to test the practicality of bombing from 40,000 feet. The aircraft, which could only carry a single 250kg bomb, had no armament and so for survival relied solely on its ability to fly higher than any British fighter then in service. Bristol was targeted on the morning of August 28th by a single Junkers which dropped its bomb on Broad Weir killing 45 people, in what was the city's worst single incident of World War Two. In an attempt to counter this new threat several suitably modified Spitfires were issued to the specially formed 'SS' Flight at Northolt, near London, and a new control system was introduced involving a number of GCI stations in Southern England simultaneously feeding plots of both the intercepting fighter and the high altitude raider to a special Area Control Room. This procedure,

code-named 'Windgap', was unsuccessfully tried on September 11th but the following day, during another attempt against Bristol, the Spitfire made contact with the raider over Salisbury forcing the Germans to jettison their bomb and to return to France suffering combat damage. So ended the highest altitude air battle ever fought over England, and with it the experimental attacks.

Towards the end of the year it was also decided to mount 'Z' projectiles on certain 'Starfish' sites in sets of twelve, electrically coupled, so that they could be fired in salvos of four to give realism and the illusion that the anti-aircraft barrage had been extended. Furthermore, in early December 1942 there was an exchange of 3.7" heavy guns for 4.5" guns between the Bristol and London areas, and this resulted in these weapons being installed, four each, at Pilning, Rockingham, Portbury and Lodge Farm. The 4.5" gun was a fairly simple weapon on a static mounting and was usually protected by an all-enveloping shield. Its rate of fire, eight 55 pound rounds per minute, was lower than the 3.7" and its muzzle velocity and effective ceiling of 26,000 feet only marginally higher.

The changes to Bristol's air defences continued into the New Year. Following the transfer of No. 87 Squadron to North Africa in November 1942 and the withdrawing of the 'Turbinlight' Havocs and Bostons in January 1943 Charmy Down ceased to be a fighter airfield involved in local defence. During late 1942 a decision had also been made to form the 71st (Glos) Heavy Anti-Aircraft Home Guard Battery to provide the personnel necessary to man the two additional 3.7" guns which were being installed on the Purdown, Reservoir, Whitchurch, Westbury and Hanham sites, and this new unit became operational at the end of February 1943. In spite of the fact that by mid-1943 improved communications and the proliferation of radar equipment capable of tracking raiders over land had caused doubt as to the future of the Royal Observer Corps, it was decided that the traditional tasks they carried out were still of value to the air defence system, especially when the Groups were linked directly to their local GCI stations. A complete re-organisation and re-appraisal of their duties was, however, carried out which resulted, in June, in the ROC taking over from Fighter Command the responsibility for issuing Air Raid Warnings. As men over 50 years of age were now considered too old to serve in the Control Centres, in Bristol their place was taken by young women and a move made from their cramped premises at Little King Street to a new and better equipped Control Centre at Clifton.

During mid-August orders were issued to make additions to the searchlight layout in the Bristol Gun Defended Area in an attempt to improve the production of the constant and high degree of illumination required for gun engagement by 'seen' fire, as well as in the 'dazzle' or

'glare' rôle. Accordingly, supplementary searchlights appeared on anti-aircraft gun positions, 'Z' sites and at, or near, unit headquarters or as satellites to existing searchlight stations. A further addition to the local anti-aircraft layout also came in August when the light anti-aircraft defences of RAF airfields were taken over by the RAF Regiment, thus releasing many 40mm Bofors guns for deployment elsewhere. This resulted, the following month, in a number being sent to the heavy sites and 'Z' positions around Bristol and Weston super Mare. Furthermore, during August the decision had been taken to re-deploy static and mobile guns to provide six-gun static sites suitable for conversion to Electrical Remote Control, starting with St. George's, Cribbs and Rodway, where electronic predictors were to eliminate the need for bearing and elevation positions to be manned. At about the same time the installation of the new and greatly improved microwave radar also went ahead at Westbury, Brickfields and Gordano, although in September the Avonmouth Smoke Screen became non-operational.

Bristol had not been bombed by the Luftwaffe during 1943, but early in 1944 there began a new series of retaliation attacks, known as the 'Steinbock Raids' or 'Baby Blitz'. To counter these, on March 26th No. 219 Squadron equipped with Mosquitos was moved to Colerne, and immediately saw action during the attempted raid on Bristol the following night, a Ju 88 being destroyed over Yeovil. In fact a total of 10 bombers out of the 116 dispatched failed to return, many probably falling to the guns of Fighter Command, confirmed local victories going to a Beaufighter of No. 406 (Canadian) Squadron from Exeter which was responsible for downing a Ju 88 near Berkeley, and another Beaufighter, this time from No. 68 Squadron at Fairwood Common, which shot down a Ju 188 near Wells. The attack was a complete failure with the raiders missing Bristol altogether; nevertheless, incidents were reported over much of Southern England with many Phosphorous bombs falling on the outskirts of Weston-super-Mare. In reply the heavy guns at Bath and Weston fired 138 and 322 rounds respectively, while Bristol's defences expended 80 heavy rounds and 91 UPs. The Kenn Moor 'Starfish' was also fired, as was the Bleadon decoy which collected 26 Phosphorous and high explosive bombs and a number of incendiaries. Another attempt was made against Bristol on the night of April 23rd, some 14 German aircraft being lost from the force of 93 which had been dispatched. Once again a number of these were shot down by RAF fighters, including the Ju 88 which came down at Hill Deverill, in Wiltshire, but as on the previous raid the Germans completely failed to locate their target, the nearest bombs being dropped at Batheaston. As a result the local guns were only able to reply with 28 rounds, while the strategic operation by the Cheddar 'Starfish', aimed at attracting scattered raiders, was equally unsuccessful.

By this time Colerne was much involved in the build up for the intended invasion of Europe and so Zeals airfield, in Wiltshire, was pressed into service as a temporary satellite. It was intended that it should house two night fighter squadrons and the first, No. 488 (New Zealand) equipped with Mosquitos, arrived just in time for another raid on Bristol which was carried out on the night of May 14th. During this operation, in which some 68 bombers made for the docks, the Mosquitos from Zeals are known to have shot down two aircraft over Somerset, a Ju 188 which fell at Temple Combe, and a Dornier Do 217 which crashed near Yeovilton. Elsewhere in Southern England other RAF squadrons were equally successful and during the night a total of 13 Luftwaffe aircraft were destroyed for the loss of just one RAF pilot. As well as the fighters other elements of the local air defences had also been in action with the heavy anti-aircraft guns firing 1107 rounds, and the 'Z' batteries discharging 207 UPs. Yet again German navigation was appalling and only one raider succeeded in reaching Bristol, where a bomb fell near a searchlight site at Kings Weston, killing an operator from the 68th Searchlight Regiment, the last person to lose his life in Bristol as a result of enemy action during World War Two.

With the unsustainable attrition rate now being suffered during attempts against Bristol, coupled with the concentration of invasion forces in the South Coast ports, which offered easier targets for the inexperienced German aircrews, the night of May 14th proved to be the last occasion on which Luftwaffe aircraft ventured over the city. Shortly after the 'D-Day' landings in France the sites around Cherbourg, from which the Germans had prepared to fire V1 flying bombs and V2 rockets at Bristol, were overrun by Allied troops thereby removing the last threat to the city. This immediately rendered the local air defences redundant resulting in many of the men and much of the equipment being transferred to the eastern side of the country or sent to support the army on the Continent. The first element to be withdrawn was the local bomb disposal unit which moved to Weymouth at the end of June. Shortly after, on July 12th Bristol's barrage balloons were hauled down for the last time, while September 1st saw the closure of all radio counter-measures and decoy sites in the West Country. The next to go was the Home Guard which was stood down on November 1st, followed on December 12th by all anti-aircraft weapons in the Bristol Gun Defended Area being declared non-operational. The airfield at Colerne and the local Royal Observer Corps Centre, however, were retained and remained active until the end of the war.

Although more effective by day, there is little doubt that Bristol's air defences as they existed at the start of the raids in June 1940 were totally inadequate for so important a target. Only six heavy gun sites were

operational around the city, and while the balloon barrage was almost up to strength, the new local fighter group was only just being established and was for some considerable time forced to operate from totally inadequate airfields, and to attempt night interceptions with unsuitable aircraft and no radar guided ground control. No Bofors guns had yet arrived to protect the important local airfields and aircraft factories, the outer searchlight areas were undermanned, and a radio counter-measures and decoy organisation had yet to be formed. This unfortunate situation was not, however, confined to Bristol, but existed throughout the country and was very much due to a pre-war policy towards re-armament which resulted, from the air defence point of view, in 'too little too late' both in terms of men and equipment. The losses sustained at Dunkirk also needed to be made up, and right through the 'Night Blitz' of the winter of 1940/41 the Bristol area was in fact without any real protection from German bombers.

Nevertheless, in spite of their inadequacies the local defences certainly did not go unnoticed by the Germans. As early as the end of June 1940 aircrew returning from nocturnal sorties had confirmed a balloon barrage flying at 3000 to 4000 metres in a half circle about Bristol, with another at a similar altitude to the north of the city. Strong searchlights and heavy well laid flak were also encountered, and this continued to be the case for almost a year. Furthermore, on the night of December 6th decoy sites were first noted in crew reports and were thereafter regularly mentioned in a variety of forms, a few even being said to resemble triangles. Among the large number subsequently reported in the Bristol area some burnt with a reddish colour, while others appeared to contain magnesium fires or lights which pulsed on and off. Although a small number of night fighters had also been encountered over the area since mid-August they initially posed no threat and it was not until early April 1941 that Luftwaffe documents first record bombers returning from Bristol with combat damage caused by cannon-armed interceptors. It is therefore ironical that by this time, just when the application of the latest technology coupled with the arrival of sufficient suitable equipment was at last giving the defences the power to cause problems for the Luftwaffe, the majority of their bombers were about to commence a move to the Eastern Front, from which most never returned. From late 1941 onwards, in spite of the constant transfer away of many fit and able men from Balloon and Anti-Aircraft Command, the local air defence system was expanded and improved to such an extent that by early 1944 it was able to inflict unacceptable losses upon the Luftwaffe, which was now totally incapable of causing any disruption to the war effort in the Bristol area.

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